Monroe Street Bridge
(State M-50, M-125 Bridge)
Monroe Street over the River Raisin
Monroe
Monroe County
Michigan

HAER No. MI-35

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
MID-ATLANTIC REGION, NATIONAL PARK SERVICE
DEPARTMENT OF THE INTERIOR
PHILADELPHIA, PENNSYLVANIA 19106

HISTORIC AMERICAN ENGINEERING RECORD

MONROE STREET BRIDGE (State M-50/M-125 Bridge)

HAER No. MI-35

Location:	Spanning the River Raisin at Monroe Street, Monroe, Monroe County, Michigan USGS Monroe, Michigan Quadrangle UTM: 17.301200.4643170
Date of Construction:	1927-1929
Engineer, Builder:	Michigan State Highway Department, W.H. Knapp Company
Present Owner:	Michigan Department of Transportation 425 West Ottawa, P.O. Box 30050 Lansing, Michigan 48909
Present Use:	Vehicular and Pedestrian Bridge
Significance:	The Monroe Street Bridge is an early example of a reinforced concrete cantilever girder bridge, a design developed in the late 1910s as an alternative to standard concrete arch bridge designs. The bridge was a key component of a major upgrading of the US-25 (later M-125) highway linking Detroit to Toledo. The builder, the W.H. Knapp Co., built several concrete bridges in Monroe County in the 1920s.
Project Information:	This documentation was undertaken in May, 1989 in accordance with the Memorandum of Agreement by the Federal Highway Administration, the Michigan Department of Transportation, the State Historic Preservation Officer, and the Advisory Council on Historic Preservation as a mitigative measure prior to the demolition of the bridge. Dr. Charles K. Hyde, Department of History, Wayne State University Detroit, Michigan 48202

PART I: HISTORY OF THE MONROE STREET BRIDGE

Monroe is located at the western end of Lake Erie and straddles the River Raisin some three miles west of the lakeshore. In 1784, Francis Navarre and a group of French-Canadians founded the settlement of Frenchtown, downstream from present-day Monroe and located on the south side of the Raisin, so-named because of the wild grapes the early French explorers discovered on its banks. Frenchtown was the scene of several bloody battles in the wars between the French, English, Indians, and Americans ending with the War of 1812, when Indians slaughtered a number of captives.[1]

The incorporation of the Village of Monroe in 1817, on lands south of the River Raisin, and the subsequent growth of settlements on the north side, created the need for a bridge near the site of the present structure. In June, 1819, the county supervisors and the town council awarded Oliver Johnson and John Anderson a franchise to build and operate a toll bridge for twenty-five years. They erected a timber covered bridge, which was destroyed by flood and replaced by an open timber bridge, built jointly by the City of Monroe (incorporated in 1837) and the county. This too was destroyed by floods in the spring of 1878 and was replaced by the two-span through truss bridge still in use in 1928.[2] From the 1850s until the late 1910s, Monroe had only two bridges to accommodate wagons and automobiles, one at Monroe Street and a second at nearby Macomb Street. Two additional vehicular bridges were built in the late 1910s.[3]

The iron truss bridge that carried Monroe Street over the Raisin created a major traffic bottleneck because of its narrow width and alignment. The iron bridge was 215 feet long, nearly twenty-four feet wide and provided a roadway of about twenty-two feet. It carried two sets of trolley tracks for the Detroit United Railway, which also owned a trolley barn and electric generating plant (ca. 1905) located immediately north of the bridge. Because the bridge was situated about thirty feet east of the line of Monroe Street on both sides of the river, streetcars and cars had to veer sharply immediately before and after crossing the river. The new bridge was only one element in a major project that included widening and re-aligning Monroe Street on both sides of the river.[4]

Although the Monroe Street bridge was a City of Monroe project, it was designed by the Michigan State Highway Department, under the direction of C.A. Melick, the department's bridge engineer.[5] The City of Monroe and the State of Michigan were proposing that the Federal government designate the Dixie Highway (U.S. Highway 25), which included Monroe Street, as a Federal trunk line highway connecting Detroit and Toledo. It would run parallel to Telegraph Road (U.S. Highway 24) and relieve the congestion on that trunk line. The state highway engineers designed the bridge to meet federal standards to help qualify the route as a trunk line highway.[6]

The Monroe Street Bridge utilized a design which emerged in the early 1920s as a popular alternative to the reinforced concrete arch bridge. The cantilever girder or beam design utilized curved girders, with each span consisting of one or more pair of cantilever arms supported on piers. The cantilever girder bridge could be constructed more economically than an ordinary concrete girder bridge, but resulted in longer spans, and resembled an arch bridge in appearance as well. The cantilever girder design was often used where a standard concrete arch bridge would be extraordinarily costly because of foundation conditions.[7] Bridge engineers also recognized that in the eyes of the public at least, arch bridges were aesthetically more pleasing than girder bridges.[8]

One of the first detailed discussions of this design can be found in George A. Hool, Reinforced Concrete Construction, III, Bridges and Culverts (1916). Among the examples that Hool cited was a 25-span viaduct and a three-span highway bridge in Cincinnati, along with a three-span bridge over the Rouge River in Wayne County, Michigan, with no identification of the facility carried.[9] Nearly ten years later, Engineering News-Record discussed the building of three cantilever girder bridges in Michigan and incorrectly claimed that the Telegraph Road (US-24) bridge over the Raisin River in Monroe was the first of this type in Michigan.[10] By the early 1930s, the use of rigid-frame design, both in reinforced concrete and structural steel, for short-span bridges became commonplace, necessitating book-length studies which treated the theory of rigid-frame design and provided engineers with the formulas and tables needed to produce economical designs.[11]

On November 14, 1927, the City of Monroe, with the Michigan State Highway Department acting as its agent, awarded the Monroe Street bridge contract, in the amount of $70,443.55, to W. H. Knapp Company, identified as "a Co-partnership, of Monroe, Michigan." The work was to begin immediately, with September 1, 1928 as the date of completion.[12]

W. H. Knapp Company was a well-established paving and construction firm with considerable experience in concrete work. Walter H. Knapp (1889-1979), born on a farm in Ida, Michigan, also in Monroe County, graduated from the University of Michigan School of Engineering in 1912 and founded the W.H. Knapp Company later that year. His firm specialized in concrete paving work in Monroe County and southeast Michigan.[13] Daniel Hasley and E. C. Betz joined Knapp as partners in 1920 and the firm enjoyed considerable success for the entire decade. In 1928, the W.H. Knapp Company completed contracts worth more than $1 million, more than double its business in 1927, with three-quarters of the total from paving work. One sign of the firm's prosperity was its new combination warehouse and office building on Telegraph Road, opened in 1928 at a cost of over $27,000, including land.[14]

The Monroe Street bridge project was to proceed as follows: the existing iron truss bridge would be moved about 20 feet to the east and placed on temporary supports to allow continued use by the Detroit United Railway, automobiles, and pedestrians; the new piers and abutments would be completed between December, 1927 and May, 1928; the central section of the new superstructure would be poured first (June 1, 1928), followed by the western section (July 1, 1928); after the center section had cured for three weeks, the Detroit United Railway was to lay new track across the new bridge; the old steel bridge would then be removed and the eastern section of the new bridge would be poured (August 10, 1928); and sidewalks and railings would be completed in late August, along with the concrete road surface, enabling the bridge to open to traffic by the beginning of September.[15] But high river levels delayed this project several months right from the start, causing the State Highway Department to extend the completion date to April 1, 1929, which the contractor was still not able to meet.[16]

The progress of the bridge construction can be documented in detail because the Monroe Evening News ran periodic articles on the project and a useful set of construction photographs has survived. Several photographs taken in the spring of 1928 show that Knapp had already moved the steel bridge and had begun casting the concrete footings and piers for the new bridge. The work of widening and straightening out Monroe Street between Front Street and the River Raisin, also done by the W. H. Knapp Company, was begun in the spring of 1928. Buildings fronting on the west side of Monroe between Front and the Raisin were either demolished or substantially cut back.[17]

The erection of falsework for the center section of the bridge took about three weeks and was a labor-intensive operation. The actual concrete pour was completed on July 16th, as reported by Floyd C. Cramer, the construction foreman for W.H. Knapp, and revealed in the contemporary photographs.[18] The pour was done continuously, using a concrete mixer which transferred the mixed concrete into small cars which ran along tracks above the formwork, where they were dumped. Once the "pour" had commenced, it had to be continuous, as required by the contract. To insure against any break in the mixing and pouring of the concrete, Knapp had a extra concrete mixer in reserve.[19]

The iron bridge was still standing and in use in July, 1928. Knapp removed the old bridge in late August, after the streetcar line was moved to the center section of the new bridge. By early September, the western segment of the bridge had been poured and the contractor was going to finish the eastern section.[20] At the beginning of December, Knapp was putting the finishing touches on the bridge, including pouring the last section of railing, on the eastern part of the bridge, and completing the retaining walls. The decorative light standards, which would also support the electric trolley wires, were also installed by then. The firm expected that the bridge would carry traffic by mid-December, if good weather prevailed.[21] This was an overly-optimistic projection. The sidewalks were not finished until March, 1929, with paving still not completed at that point.[22] In May, 1929, the City of Monroe announced its plans to purchase the Detroit United Railway property north of the bridge, allowing the entire Monroe Street widening project to be completed.[23]

Once finished, the new bridge was marked with two cast bronze plaques or nameplates, each mounted horizontally on the approach railings at the southeast and northwest corners of the bridge. The nameplates read as follows:

MONROE STREET BRIDGE

No. B3 OF 58-7-3 1927

BUILT BY
CITY OF MONROE

Under the Supervision of
Frank F. Rogers
State Highway Commissioner

City Commissioners
Denias Dawe, Mayor
Theodore Weisel - William F. Dusablon
Frank Daibler - Charles E. Curson
George Danz - Arthur Navarre

Contractor, W. H. Knapp Co. Monroe.

The Monroe Street bridge finally opened to traffic on the morning of July 20, 1928, with formal dedication ceremonies. The dignitaries present included Monroe Mayor Denias Dawe, City Engineer Victor Newman, City Attorney J. C. Lehr, Judge Carl Franke of the Monroe County Probate Court, C.A. Melick, Bridge Engineer for the Michigan State Highway Department, and J. W. Hannen, editor of Michigan Roads and Pavements magazine. This was e colorful and festive occasion for Monroe: "Floral displays of chrysanthemums and evergreen boughs predominated on the bridge proper, and with the bunting and flags made up the scheme of decoration." Entertainment included a local quartet of singers, a soloist, and the American Legion 22-piece drum and bugle corps. Following several speeches by the assembled politicians, Miss Clara Catherine Dusablon cut the tape, and traffic crossed the new span for the first time.[24] The State Highway Department officially accepted the bridge three days later.[25]

The Monroe Street Bridge has undergone several minor modifications and one substantial one since it opened to traffic in July, 1929. Two pairs of octagonal light standards, described as "Sheridan 24 Inch Combined Light and Trolley Granite Standard with Duplex Bracket and Paragon Light,"[26] were installed on the sidewalk above the first and fourth sets of piers. These were removed at a much later date, probably in the 1960s and replaced by a pair of modern street lights.

A second change consisted of placing rectangular concrete flower boxes on the tops of the eight oversized pilasters over the piers, part of the bridge railing. The flower box contract was let in April, 1948, with installation during the summer of that year.[27] By May, 1989, only five of the eight flower boxes were extant.

More significantly, the bridge structure proper was altered in the mid-1970s after inspectors found that several of the arches had sagged or deflected to the point that there were no longer gaps between them, i.e., that the ends of the arches touched. To stabilize the bridge, the Michigan Department of Transportation filled in the remaining gaps between the arches with concrete, this altering not only the appearance of the bridge, but also the way it worked structurally.[28]

Finally, in April, 1984, a concrete block retaining wall was built behind the abutment at the southwest end of the bridge, as part of a downtown Monroe beautification project. Schumaker Brothers Operating Engineers completed this work.[29]

II. DESCRIPTION OF THE MONROE STREET BRIDGE

The Monroe Street bridge is a five-span reinforced concrete cantilever girder structure, resting on reinforced concrete piers and abutments, which in turn rest on reinforced concrete footings built on bedrock. Overall, it is 211 feet long, 70 feet wide, provides a roadway 46 feet wide and two sidewalks, each 10 feet in width. Each span consists of six reinforced concrete cantilever girders, each resting on an open, pylon-like pier. The bridge also features a monumental balustrated railing. Overall, it is symmetrical in design, but the five spans are not identical in dimensions. The middle span measures 36 feet 5 inches between piers, or 43 feet 5 inches center to center on the piers. It is flanked by two spans which measure 35 feet 4 inches between piers or 42 feet 4 inches center to center. The end spans each measure 32 feet 6 inches between piers and the abutments or 41 feet 6 inches center to center. The bridge structure includes two abutments that are distinctly asymmetrical. The south abutment is 86 feet wide and 7 feet 3 inches long, while the north abutment, also 86 feet wide, is 30 feet long.

The bridge rests on four sets of six open pylon-like piers in the River Raisin. Two additional sets of six piers, which are not open, are the principal structural elements of the bridge's abutments. The piers, which are 6 feet square at the base, rest on and are structurally connected (through steel reinforcing rods) to a solid concrete footing 3 feet deep, 7 feet wide and 61 feet 9 inches long, allowing 4 feet 9 inches between the bases of neighboring piers, six inches between the base of the pier and the edge of the footing, and 2 feet between the base of the outer piers and the ends of the footing. Each pier, 4 feet wide at the base, narrows to 3 feet in width at the top of the shaft, and has a cap 1 foot six inches high and 3 feet 5 inches wide. Overall, the piers measure 11 feet 4 3/4 inches in height. The location of the steel reinforcing rods and the general method of construction can be seen in the historic views and engineering drawings which are part of this report.

Each span of the Monroe Street bridge consists of six cantilever girders or ribs, which rest on the piers. The two center ribs, originally designed for the live loads of moving streetcar trains, are significantly larger than the other four ribs. The two center ribs are 2 feet 6 inches wide, while the two pair which flank the center ribs are 1 foot 6 inches in width. These are connected to each other at the piers with narrow side ribs, while smaller cantilever ribs support the sidewalks. The ribs are also connected to each other via a 9 1/2 inch thick horizontal reinforced concrete slab, creating a massive monolithic superstructure. The Michigan State Highway Department gave the contractor detailed instructions for erecting the falsework needed to support the forms that held the concrete. The actual road surface or wearing surface rests on top of the monolithic concrete slab and ribs, which comprise the superstructure. The wearing surface, of reinforced concrete 4 inches thick at the center of the road and 3 inches thick at the sidewalks, was cast only after the underlying slab was cleaned and waterproofed.[30]

The balustraded concrete railings stand 3 feet 2 inches in height from the base to the top. They are interrupted by large pilasters above each pier and slightly smaller pilasters at the abutments. Each span has four additional pilasters of intermediate size, with seven spindles comprising the rest of the balustrade between pilasters. All of the pilasters and spindles have a distinct base, shaft, and cap. The pier pilasters measure 3 feet long, 1 foot 9 inches wide, and 3 feet 3 1/2 inches high. Abutment pilasters are one foot 11 inches long, 1 foot 9 inches wide, and 3 feet 3 1/2 inches high. Intermediate pilasters are 1 foot 6 inches long, 1 foot 4 inches wide, and 3 feet 2 3/4 inches high. Spindles are 7 1/2 inches long, 6 1/2 inches wide, and 1 foot 9 1/4 inches high.

The rectangular concrete flower boxes, which rest on the pier pilasters, are 12 inches high, 32 inches X 17 inches at the base, and 36 inches X 21 inches at the top because of a two inch lip. The interior space available for planting measured 28 inches X 13 inches X 10 inches. They were originally equipped with 3/4 inch drainpipes. The rectangular bronze nameplate, with rounded corners, measures 16 5/8 inches X 12 7/8 inches X 5/16 inches thick.

NOTES

[1]Willis F. Dunbar and George S. May, Michigan: A History of the Wolverine State (Grand Rapids: William B. Eerdmans Publishing Company, 1980), pp. 157-58, 197.

[2]John McClelland Bulkley, History of Monroe County, Michigan: A Narrative Account of Its Historical Progress, Its People, and Its Principal Interests (Chicago: Lewis Publishing Company, 1913), Vol. I, p. 474.

[3]Ibid. and Sanborn Publishing Company, Insurance Maps of Monroe, Michigan, dated 1888, 1893, 1899, 1908, and 1922.

[4]Monroe Evening News, 14 July 1977, p. 10-A. Monroe city residents approved bond issues totalling $375,000 for the planned improvements, with only $75,000 earmarked for the bridge replacement proper.

[5]Ibid., 20 July 1929, p. 2.

[6]Ibid., 31 December 1928, special section, n.p.

[7]George B. Hool, Reinforced Concrete Construction, Vol. III, Bridges and Culverts (New York: McGraw-Hill Book Company, 1916), pp. 403-409 and Searcy B. Slack, "Low-Cost Bridges," Proceedings of the Nineteenth Annual Highway Conference, Held at the University of Michigan, February 14 to 16, 1933 (Ann Arbor: University of Michigan Official Publication, Vol. 34, Number 38, 1933), p. 158.

[8]C. B. McCullough, Economics of Highway Bridge Types (Chicago: Gillette Publishing Company, 1929), p. 22. He rates the arch design as the most attractive of the common bridge designs.

[9]Hoole, Reinforced Concrete Construction, Volume III, pp. 403-406.

[10]"Highway Bridge Construction Activity in 1925," Engineering News-Record, Vol. 96, No. 2 (January 14, 1926), p. 81 and No. 3 (January 21, 1926), p. 122.

[11]Arthur G. Hayden, The Rigid-Frame Bridge (New York: John Wiley & Sons, 1931).

[12]"Contract and Bonds, Advice Bridge No. 3 of 58-7-3, Contract 1," file in the Michigan Department of Transportation records, State of Michigan Record Center, Lot 1806, Box 16.

[13]Monroe Evening News, 25 June 1979, p. 14-A.

[14]Ibid, 31 December 1928, special section, n.p.

[15]"Contract and Bonds, Advice Bridge No. 3 of 58-7-3, Contract 1," Michigan Department of Transportation records, State of Michigan Record Center Lot 1806, Box 16 and "General Layout," 19 September and 2 November 1927, Sheet No. 1 of 19, Engineering Drawings, B. 3 of 58-7-3, Michigan Department of Transportation records, State of Michigan Record Center Lot 2154-S.

[16]Monroe Evening News, 1 December 1928, p. 1.

[17]Monroe Evening News, 17 July 1926, p. 6 and 14 July 1977, p. 10-A; two photographs, dated Spring, 1928, in the collection of Carl F. Cramer, Sr. of Monroe, Michigan; and two photographs of pier and abutment work, 4 May 1928, shot by "E.H.H.," Michigan State Highway Department Collection, Record Group 59-17, Monroe County, State of Michigan Archives, Lansing, Michigan.

[18]Monroe Evening News, 17 July 1928, p. 6; two photographs by Charles Hill, a prominent Monroe photographer, dated July 5, 1928 and July 16th, 1928, both in the collection of Carl F. Cramer, Sr.; and "Section of Superstructure Form Work," July 13, 1928, photograph by "E.H.H.," Michigan Highway Department Collection, State of Michigan Archives.

[19]Carl F. Cramer, Sr., the son of Floyd Cramer, explained the concrete mixing and delivery system in an interview on 29 April 1989 in Monroe, Michigan.

[20]Monroe Evening News, 3 September 1928, p. 1.

[21]Ibid., 1 December 1928, p. 1.

[22]Ibid., 28 March 1929, p. 11.

[23]Ibid., 21 May 1929, p. 1.

[24]Ibid., 20 July 1929, pp. 1-2.

[25]Michigan State Highway Department to the W. H. Knapp Company, 1 August 1929, in the Michigan Department of Transportation Records, State of Michigan Record Center, Lot 1806, File 16.

[26]"Electric Lighting Plan," (18 October-4 November 1927) Sheet No 19 of 19, Engineering Drawings, Br. 3 of 58-7-3, MDOT Records, State of Michigan Record Center, Lot 2154-S.

[27]"Contract and Bonds, Advice Bridge No. 3 of 58-7-3," MDOT records, State of Michigan Record Center, Lot 1806, Box 16.

[28]Michigan Department of Transportation, Environmental Assessment Programmatic Section 4(F) Evaluation (Lansing: MDOT, 1988), p. 21.

[29]Monroe Evening News, 3 April 1984, p. 2.

[30]"Superstructure Concrete Details," 12 September - 4 November 1927, Sheet No. 3 of 19, Engineering Drawings, Br. 3 of 58-7-3.

III. SOURCES OF INFORMATION

A. Architectural Drawings: Engineering Drawings, Br. 3 of 58-7-3, Michigan Department of Transportation records, State of Michigan Record Center, Lansing, Michigan, Lot 2154-S. This is a complete set of drawings, a total of 19 sheets, dating from August through November, 1927. They were produced by a team of draftsmen, identified as "Squad No. 5" on all the sheets. They were typically drawn by one person, traced by another, checked by still another, and then filed by a fourth person.

B. Historic Views: Two major groups of historic photographs have survived. Carl F. Cramer, Sr., 421 West Third Street, Monroe, Michigan 48161, has six views, half of which were taken by a long-time Monroe photographer, Charles Hill. These are all free of copyright protection. The second collection consists of eight negatives in the Michigan State Highway Department Collection, Monroe County, Record Group 59-17, State of Michigan Archives, 717 West Allegan, Lansing, Michigan 48918.

C. Interviews: Brief interview with Carl F. Cramer, Sr. in Monroe on 29 April 1989. He is the son of Floyd Cramer, construction foreman for the W.H. Knapp Company.

D. Bibliography

1. Primary and unpublished sources:

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Monroe Evening News, 1927-1929.

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D. Bibliography (Continued)

2. Secondary and published sources:

Anon. "Highway Bridge Construction Activity in 1925," Engineering News-Record, Vol. 96, No. 2 (January 14, 1926), pp. 79-83 and No. 3 (January 21, 1926), pp. 122-124.

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MONROE STREET BRIDGE
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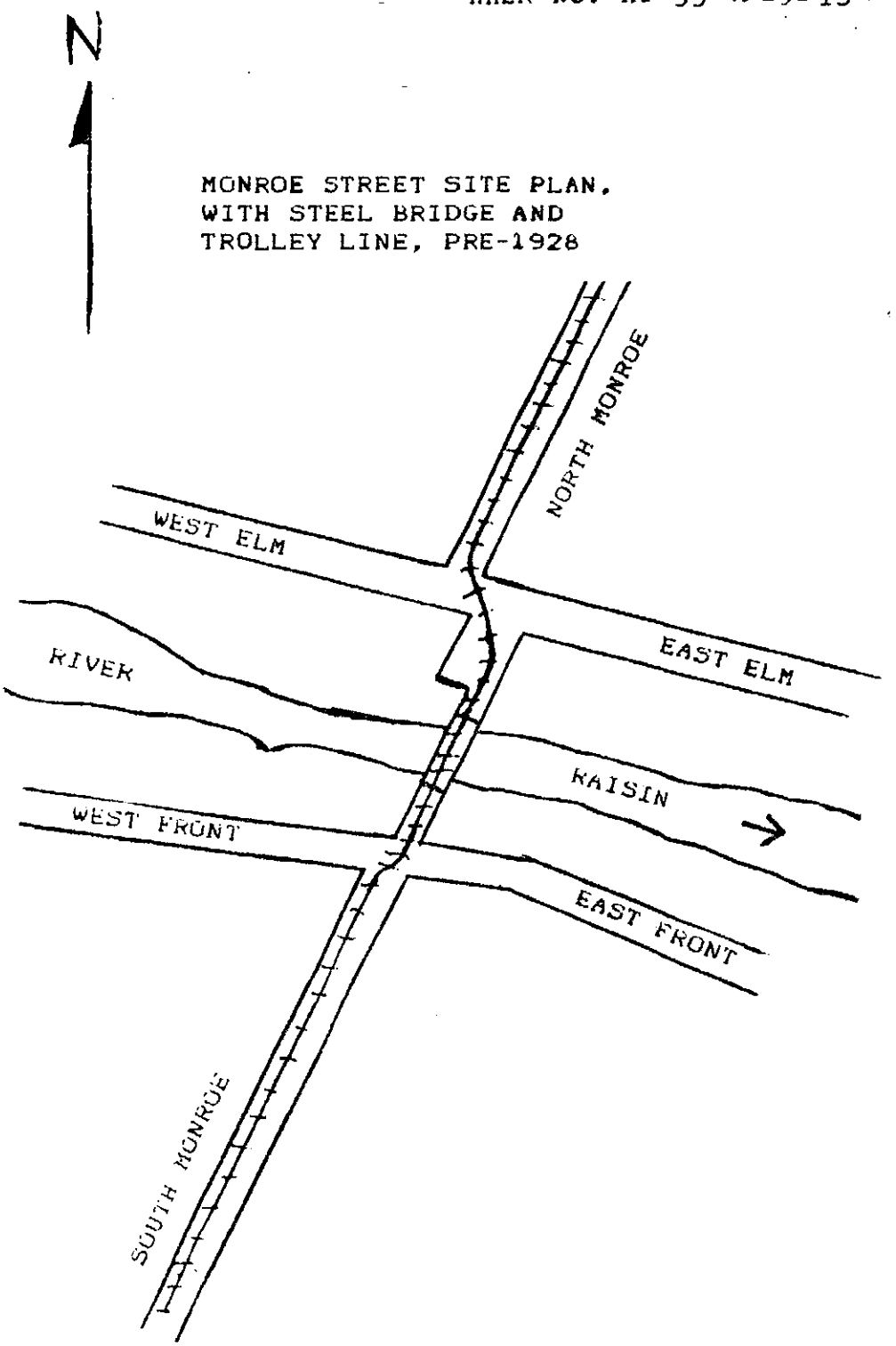
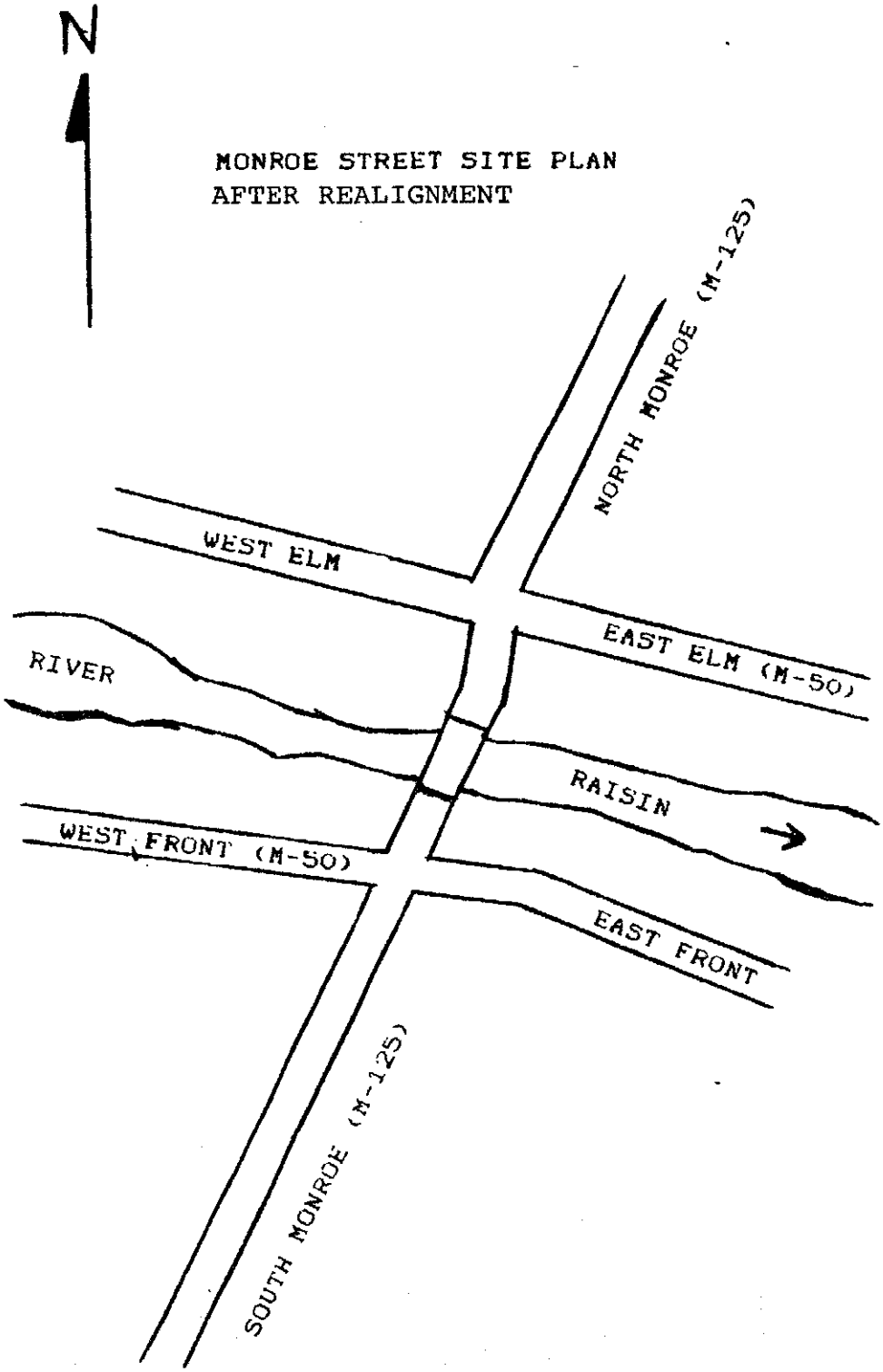
HAER No. MI-35 (Page 15)

MONROE STREET SITE PLAN,
WITH STEEL BRIDGE AND
TROLLEY LINE, PRE-1928

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MONROE STREET SITE PLAN
AFTER REALIGNMENT
NORTH MONROE (M-125)
WEST ELM
EAST ELM (M-50)
RIVER
RAISIN
WEST FRONT (M-50)
EAST FRONT
SOUTH MONROE (M-125)